uality is not immortality in its strictest sense. It is, however, "the only lasting kind of life that I can discover in the realm of our experience." Ethics is rather purified and strengthened than threatened by this conception. P. E. WINTER.

Beiträge zur Psychologie und Philosophie, herausgeben von GOETZ MARTIUS. Erster Band, 4. Heft. Leipzig, 1905.

(1). G. Martius, Ueber die Lehre von der Beeinflussung des Pulses und der Atmung durch psychische Reize.

(2). C. Minnemann, Atmung und Puls bei actuellen Affekten.

Dr. Martius' paper attempts to arrive at an understanding of the discrepant results which, up to the present time, have followed the application of the method of expression to the study of the feelings. Several serious faults in technique are brought out; and, with a plethysmograph so constructed as to avoid these errors, a study of the simpler affective processes is made by Martius, and of the emotions by Minnemann. After alluding to the wide differences in result, as regards the question of the influence of mental processes on pulse and respiration, Martius points out that these differences must mean either that the method is inadequate and the problem wrongly formulated, or that the method has not been applied with the proper precautions. The latter possibility is the more probable for two reasons: (i) faults in technique; (ii) errors in interpretation. Three faults of technique are mentioned: (a) the effect of respiration on the rate and height of pulse; Martius is convinced that expiration heightens and slackens pulse; (b) the methods of measuring the rate of pulse. Two methods are aimed at in this criticism: the determination of the number of pulses for some arbitrary period (usually five or ten seconds), and the method used by Lehmann, of dividing the curve into variable periods, apparently according to the *niveau*. The criticism is the same for both methods: that the influence of respiration (the slackening and heightening mentioned above) vitiates the results. (c) The lowering of the height of the volume pulse by the fall in volume of the arm. This fact has been explained on the supposition that fall in volume caused a reduction of the blood pressure; the height of pulse would, if that were true, be less. Martius, however, finds that the mere drawing out of the arm from the plethysmograph brings about a fall in volume *with a reduced height of pulse*. He thinks that this reduction is due to the rarefaction of the air in the manometer and the consequent poor transmission of the impulse. The chief error of interpretation regards the significance of the longer waves that are to be found in nearly all plethysmographic records. Briefly, Martius' view is that all changes in level, except the respiratory oscillation, are due to unconscious movements of the hand or arm or, perhaps, other parts of the body. In this belief, he constructed a plethysmograph such that all movements of the body were rendered ineffective. The instrument consisted of a metal sleeve which was provided with a manometer and a cock for admitting water. The sleeve was slipped over the fore-arm. The joint of the metal and the arm was made with plaster of Paris and, further, the arm thus encased in the sleeve was securely attached by the same means to a board which was clamped to the table. In this way, there could be no pushing or pulling of the arm in or out of the plethysmograph. The records were obtained in the usual manner. The measurements of the curves are the lengths of each individual pulse or respiration. Preliminary records with this instrument show that (i) in proportion as the movements and the possibilities of movement are excluded, the smaller and less important do the volume changes become; and that (ii) of the changes that remain, the irregu-

lar sinkings and rises disappear, while the regular changes persist (*cf.* p. 449). Martius finds that the curve taken under the conditions described is very similar to the curve recorded by the Lehmann plethysmograph with the cock open. This fact is, probably, the justification for Minneman's practice of using the Lehmann plethysmograph with the cock open.

The following topics were investigated:

1. Influence of artificial changes of respiration on pulse.
2. " " bodily work (ergograph).
3. " " mental activity (arithmetic).
4. " " bodily pain.
5. " " smell and taste.
6. " " artificially produced emotions.

The results were:

1. Acceleration of breathing causes accelerated pulse. Deepened breathing accelerates pulse. Slower breathing slows pulse.
2. Rate of both pulse and breathing is increased. The height does not change consistently; it tends, perhaps, to be less.
3. Rate and height of both pulse and respiration are increased.
4. Mixed. Rate of pulse is, in most cases, faster; height, where changed, less. Respiratory changes are equivocal.
5. As regards pleasantness and unpleasantness, there are no constant characteristics.
6. There is an emotive type, characterized by slowing of pulse and respiration, which is the opposite of an active type.

The last result reminds one of the view advanced by Binet, that the opposition of feelings and emotions is not between their pleasantness and unpleasantness, but between activity and repose.

The occasion of Minnemann's work was the possibility that the reproduced emotions, which were the object of Martius' study, might have different expressions from naturally aroused emotions. The emotions of mirth, joy and hope were set up by suitable communications. Deception, expectation, sympathy, fright, anger, excitement were also aroused. Five persons took part in the experiments. The technique of the investigation was, practically, the same as that of Martius. Both pulse and respiration were recorded and the changes in rate and height measured. The average rates and lengths of pulse and respiration, for each observer, for the normal and the reaction periods, were measured and platted. The essential result of this work is that there are no qualitative differences of emotions which, at least by the method and under the conditions of the author, find expression in different bodily changes; the opposition is rather between the exciting and the depressing emotions. The Kantian classification of sthenic and asthenic emotive states seems to receive from this study experimental confirmation.

To the present reviewer, the most important result of Martius' work is the apparent demonstration that the vaso-motor waves are not of normal occurrence in human adults. If we grant the fact, it would seem to throw doubt on the existence, other than as artifacts, of the waves in animals under experimental conditions. A second result, which adds itself to a gradually increasing mass of evidence, is the failure to find characteristic symptoms for pleasantness and unpleasantness. What one does not find, although there is some reason to expect it, is any evidence tending to show that the reactions of pulse and respiration depend upon the quality of the stimulus used. Aside from the first two points mentioned, the critical tone of the work will, doubtless, be its most effective result.

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